WHAT IS CLAIMED IS:

[c1] 1. A method of determining geometry of a tomosynthesis system including a detector and an x-ray source, said method comprising the steps of:

arbitrarily identifying at least two markers within an imaged volume, the at least two markers being placed at different relative distances between the detector and the x-ray source, and without having projections located on a straight line for all different source positions; and

locating the projections of the markers within at least two images acquired of the imaged volume, said at least two images corresponding to different positions of a focal spot of the x-ray source wherein said step of locating is performed using a computer of the tomosynthesis system.

[c2] 2. The method as in claim 1, wherein the step of locating determines the focal spot positions of the x-ray source relative to the detector.

[c3] 3. The method as in claim 1, wherein the step of locating determines the relative geometry of the tomosynthesis system.

[c4] 4. The method as in claim 1, wherein the step of locating determines absolute tomosynthesis system geometry with respect to a fixed coordinate system within the tomosynthesis system.

[c5] 5. The method as in claim 1, wherein the markers comprise anatomical markers.

[c6] 6. The method as in claim 1, wherein the projections of the markers are located manually.

[c7] 7. The method as in claim 1, further comprising the step of:

reconstructing the geometry based upon the step of locating, said reconstructing comprising the steps of:

identifying the detector coordinates of projections of the markers onto the detector for each projection image and for each projection of a marker;

identifying an index of the corresponding marker and an index of a corresponding focal spot position of the x-ray source for each projection image and for each projection of a marker;

determining for at least one pair of markers the intersection of the line through the projections of the markers with respect to at least an unknown first focal spot position with the line through the projections of the markers with respect to at least an unknown second focal spot position, said point of intersection being identical to the point of intersection of the line drawn through the pair of markers with the plane comprising the detector;

arbitrarily selecting a first focal spot position of the x-ray source;

selecting a first one of the marker positions relative to the first source position and the position of the corresponding projection of the one marker;

determining a second one of the marker positions relative to (1) the first one of the marker positions, (2) the first source position, (3) the position of the corresponding projection of the second marker, and (4) the point of intersection of the line drawn through the pair of markers with the plane comprising the detector; and

determining a second source position relative to (1) the first one of the marker positions, (2) the second one of the marker positions, and (3) the respective positions of the projections of the two markers with respect to the second source position.

[c8] 8. The method as in claim 7, wherein the first x-ray source position is selected arbitrarily on a hemisphere determined by the length of a gantry arm supporting the x-ray source and a location of the pivot point of the gantry arm, said method further comprising the steps of:

modifying the second x-ray source position such that the second x-ray source position is located on the hemisphere, by drawing a line through the first and the

second focal spot position and by determining a point of the intersection of that line with the hemisphere, wherein the point of intersection determines the modified second x-ray source position,

re-determining the first one of the marker positions and the second one of the marker positions based upon the first x-ray source position and the modified, second x-ray source position, and the respective positions of the corresponding projections of the two markers,

determining additional x-ray source positions based upon the re-determined first one of the marker positions and the re-determined second one of the marker positions, and the respective positions of the corresponding projections of the two markers,

evaluating relative positions of additional x-ray source positions with respect to the hemisphere, and

updating the first x-ray source position according to the evaluating, and iteratively executing the modifying, the re-determining, the determining additional source positions, and evaluating until all of the determined x-ray source positions are close to the hemisphere.

[c9] 9. The method as in claim 1, wherein the focal spot positions vary between acquisitions of a set of projection radiographs of the imaged volume and are periodically determined.

[c10] 10. The method as in claim 1, wherein the focal spot positions vary with each acquisition of a set of projection radiographs of the imaged volume and are determined subsequent to each acquisition of a set of projection radiographs of the imaged volume.

[c11] 11. The method as in claim 1, where the markers are attached to the imaged object, and the projections of the markers are used by the tomosynthesis system to detect movement of the object during the image acquisition process.

[c12] 12. The method as in claim 1, wherein the object is a patient.

[c13] 13. The method as in claim 1, wherein the markers are provided in a phantom comprising a non-rigid structure.

[c14] 14. A tomosynthesis system for imaging an object, the tomosynthesis system comprising:

an x-ray source for emitting x-rays, the x-ray source having different focal spot positions as said x-ray source moves relative to the object;

a detector positioned relative to the x-ray source for receiving the emitted x-rays as the x-ray source moves relative to the object; and

a computer coupled to the x-ray source and the detector, the computer executing processes determining a geometry of the tomosynthesis system, wherein at least two markers are identified arbitrarily within an imaged volume of the object, at different relative distances between the detector and the x-ray source, and without having projections located on a straight line for all different x-ray source positions, and wherein said computer executes processes locating the projections of the markers within at least two images acquired from the imaged volume, said at least two images corresponding to the different positions of the focal spot of the x-ray source.

[c15] 15. The tomosynthesis system as in claim 14, wherein the computer determines the focal spot positions of the x-ray source relative to the detector.

[c16] 16. The tomosynthesis system as in claim 14, wherein the computer determines the relative geometry of the tomosynthesis system.

[c17] 17. The tomosynthesis system as in claim 14, wherein the markers comprise anatomical markers.

[c18] 18. The tomosynthesis system as in claim 14, wherein the projections of the markers are located manually.

[c19] 19. The tomosynthesis system as in claim 14, wherein the locating determines an absolute tomosynthesis system geometry with respect to a fixed coordinate system within the tomosynthesis system.

[c20] 20. The tomosynthesis system as in claim 14, wherein said computer executes processes further comprising the steps of:

reconstructing the geometry based upon the locating of the projections of the markers, said reconstructing comprising the steps of:

identifying the detector coordinates of projections of the markers onto the detector for each projection image and for each projection of a marker;

identifying an index of the corresponding marker and an index of a corresponding focal spot position of the x-ray source for each projection image and for each projection of a marker;

determining for at least one pair of markers the intersection of the line through the projections of the markers with respect to an unknown first focal spot position with the line through the projections of the markers with respect to an unknown second focal spot position, said point of intersection being identical to the point of intersection of the line drawn logically through the pair of markers with the plane comprising the detector;

arbitrarily selecting a first focal spot position of the x-ray source;

selecting a first one of the marker positions relative to the first source position and the position of the corresponding projection of the one marker;

determining a second one of the marker positions relative to (1) the first one of the marker positions,(2) the first source position, (3) the position of the corresponding projection of the second marker, and (4) the point of intersection of the line drawn through the pair of markers with the plane comprising the detector; and

determining a second source position relative to (1) the first one of the marker positions, (2) the second one of the marker positions, and (3) the respective positions of the projections of the two markers with respect to the second source position.

[c21] 21. The tomosynthesis system as in claim 20, wherein the computer executes processes further comprising the steps of:

selecting the first x-ray source position arbitrarily on a hemisphere determined by the length of a gantry arm supporting the x-ray source and a location of the pivot point of the gantry arm;

modifying the second x-ray source position such that the second x-ray source position is located on the hemisphere, by drawing a line through the first and the second focal spot position and by determining a point of the intersection of that line with the hemisphere, wherein the point of intersection determines the modified second x-ray source position;

re-determining the first one of the marker positions and the second one of the marker positions based upon the first x-ray source position and the modified, second x-ray source position and the respective positions of the corresponding projections of the two markers;

determining additional x-ray source positions based upon the re-determined first one of the marker positions and the re-determined second one of the marker positions, and the respective positions of the corresponding projections of the two markers;

evaluating relative positions of additional x-ray source positions with respect to the hemisphere; and

updating the first x-ray source position according to the steps of evaluating, and iteratively executing the modifying, the re-determining, the determining additional source positions, and evaluating until all of the determined x-ray source positions are close to the hemisphere.

[c22] 22. The tomosynthesis system as in claim 14, wherein the focal spot positions vary between acquisitions of a set of projection radiographs of the imaged volume and are periodically determined.

[c23] 23. The tomosynthesis system as in claim 14, wherein the focal spot positions vary with each acquisition of a set of projection radiographs of the imaged volume and are determined subsequent to each acquisition of a set of projection radiographs of the imaged volume.

[c24] 24. The tomosynthesis system as in claim 14, where the markers are attached to the imaged object, and the projections of the markers are used by the computer of the tomosynthesis system to detect movement of the object during the image acquisition process.

[c25] 25. The tomosynthesis system as in claim 14, wherein the object is a patient.

[c26] 26. The tomosynthesis system as in claim 14, wherein the markers are provided in a phantom comprising a non-rigid structure.

[c27] 27. A computer-readable medium storing a program determining geometry of a tomosynthesis system including a detector, an x-ray source and at least two markers arbitrarily identified within an imaged volume, at different relative distances between the detector and the x-ray source, and without having projections located on a straight line for all different source positions, said program which when executed by a computer causes the computer to execute the processes comprising the steps of:

locating the projections of the markers within at least two images acquired of the imaged volume using the computer of the tomosynthesis system, said at least two images corresponding to different positions of a focal spot of the x-ray source.

[c28] 28. The computer-readable medium as in claim 27, wherein the locating determines the focal spot positions of the x-ray source relative to the detector.

[c29] 29. The computer-readable medium as in claim 27, wherein the locating determines the relative geometry of the tomosynthesis system.

[c30] 30. The computer-readable medium as in claim 27, wherein the locating determines absolute tomosynthesis system geometry with respect to a fixed coordinate system within the tomosynthesis system.

[c31] 31. The computer-readable medium as in claim 27, wherein the program executed by the computer causes the computer to execute the processes further comprises the steps of:

reconstructing the geometry based upon the locating, said reconstructing comprising the steps of:

identifying the detector coordinates of projections of the markers onto the detector for each projection image and for each projection of a marker;

identifying an index of the corresponding marker and an index of a corresponding focal spot position of the x-ray source for each projection image and for each projection of a marker;

determining for at least one pair of markers the intersection of the line through the projections of the markers with respect to an unknown first focal spot position with the line through the projections of the markers with respect to an unknown second focal spot position, said point of intersection being identical to the point of intersection of the line drawn through the pair of markers with the plane comprising the detector;

arbitrarily selecting a first focal spot position of the x-ray source;

selecting a first one of the marker positions relative to the first source position and the position of the corresponding projection of the one marker;

determining a second one of the marker positions relative to (1) the first one of the marker positions,(2) the first source position, (3) the position of the corresponding

projection of the second marker, and (4) the point of intersection of the line drawn through the pair of markers with the plane comprising the detector; and

determining a second source position relative to (1) the first one of the marker positions, (2) the second one of the marker positions, and (3) the respective positions of the projections of the two markers with respect to the second source position.

[c32] 32. The computer-readable medium as in claim 31, wherein the first x-ray source position is selected arbitrarily on a hemisphere determined by the length of a gantry arm supporting the x-ray source and a location of the pivot point of the gantry arm, said wherein the program executed by the computer causes the computer to execute the processes further comprises the steps of:

modifying the second x-ray source position such that the second x-ray source position is located on the hemisphere, by drawing a line through the first and the second focal spot position and by determining a point of the intersection of that line with the hemisphere, wherein the point of intersection determines the modified second x-ray source position,

re-determining the first one of the marker positions and the second one of the marker positions based upon the first x-ray source position and the modified, second x-ray source position, and the respective positions of the corresponding projections of the two markers,

determining additional x-ray source positions based upon the re-determined first one of the marker positions and the re-determined second one of the marker positions, and the respective positions of the corresponding projections of the two markers,

evaluating relative positions of additional x-ray source positions with respect to the hemisphere, and

updating the first x-ray source position according to the evaluating, and iteratively executing the modifying, the re-determining, the determining additional

source positions, and evaluating until all of the determined x-ray source positions are close to the hemisphere.

[c33] 33. The computer-readable medium as in claim 27, wherein the focal spot positions vary with each acquisition of the imaged volume and are determined subsequent to each acquisition of the imaged volume.

[c34] 34. The computer-readable medium as in claim 27, where the markers are attached to the imaged object, and the projections of the markers are used by the tomosynthesis system to detect movement of the object during the image acquisition process.

[c35] 35. The computer-readable medium as in claim 27, wherein the object is a patient.

[c36] 36. The computer-readable medium as in claim 27, wherein the markers are provided in a phantom comprising a non-rigid structure.

[c37] 37. The computer-readable medium as in claim 27, wherein the markers are provided in a phantom comprising a non-rigid structure.

[c38] 38. A method of determining geometry of a tomosynthesis system including a detector and an x-ray source, said method comprising the steps of:

locating projections of markers wherein the markers are identified at different relative distances between the detector and the x-ray source;

drawing logic lines through pairs of locations of projections;

determining points of intersection of these lines in the detector plane; and

determining points in three-dimensional space, wherein the logic lines drawn through the pairs of points intersect a detector plane at predetermined points in the detector plane.

[c39] 39. A tomosynthesis system for imaging an object, the tomosynthesis system comprising:

an x-ray source for emitting x-rays, the x-ray source having different focal spot positions as said x-ray source moves relative to the object;

a detector positioned relative to the x-ray source for receiving the emitted x-rays as the x-ray source moves relative to the object; and

a computer coupled to the x-ray source and the detector, the computer executing processes determining a geometry of the tomosynthesis system, wherein projections of markers are located and the markers are identified at different relative distances between the detector and the x-ray source, logic lines are drawn through pairs of locations of projections, and points of intersection of these lines in the detector plane are determined, and points in three-dimensional space are determined, and wherein logic lines drawn through pairs of said points intersect a detector plane at predetermined points in the detector plane.